Item #16a: Grizzly Bear Populations

Evaluation Objectives: To evaluate whether populations of grizzly bear on the forest are consistent with criteria and methods described in Recovery Plan monitoring.

Methods: Information concerning the number of grizzly bear family groups seen in the Northern Continental Divide Ecosystem (NCDE) and grizzly bear mortalities is collected and reported annually by agency members of the Interagency Grizzly Bear Committee. Data collected includes number of females with cubs, occupancy of bear management unit (BMUs) by family groups, and known human-caused mortality.

Evaluation: The Grizzly Bear Recovery Plan (1993) identified family groups, with cubs of the year, their number and distribution, and known human-caused total and female mortality as recovery criteria. This has been monitored from 1987 – 2008. However, from the NCDE Grizzly Bear Population Monitoring Team Annual Report 2006), bear researchers and biologists agree that the above recovery criteria cannot be demonstrated in the NCDE because females with cubs are extremely difficult to observe because dense forest canopies and shrub fields conceal individuals. For this and other reasons, there has been no organized effort to collect sightings of family groups annually in the NCDE, and the size and trend of the grizzly bear population remains unknown. Therefore, the minimum annual counts are likely below actual population size and do not reflect the true status of this population of grizzly bears. The methods used to estimate NCDE population and mortality were inaccurate. With that in mind in 2008, Chris Servheen, the Grizzly Bear Coordinator sent an *Interim Revised Calculation of Mortality Limits in the NCDE* memo to the NCDE managers. In summary:

> *With the recent DNA-based population estimate from Kate Kendall and her team, these methods based on sightings of females with cubs have become outdated in the NCDE. The purpose of this memo is to outline an interim revision to the method to estimate sustainable mortality limits in the NCDE based on the new population estimate from the DNA methodology. This revised method explained in this memo will apply as an interim method until there is a formal revision to the 1993 Recovery Plan. The basis of mortality management in the NCDE is to manage known human-caused mortality within sustainable levels. Rich Harris in 1984 calculated that a sustainable level of human-caused mortality is no more than 6% of the population if no more than 30% of this known human-caused mortality is females. The 1993 Recovery Plan further states (p. 64) that in order to facilitate population recovery and account for unknown unreported mortality, the maximum known human-caused mortality limit is set at 4% of the population estimate based on the sightings of females with cubs and no more than 30% of this mortality can be females.*
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> *With the availability of the DNA-based population estimate of 765 grizzly bears in the NCDE in 2004, we can now use this number as the population estimate instead of a minimum population estimate based on females with cubs. The primary assumption that must be accepted if this number is to be applied post-2004 is that grizzly populations do not increase or decrease rapidly. Since we have no information that there has been a major change in the number of grizzly bears in the NCDE since 2004, and if we assume that grizzly populations*

increase or decrease slowly under most conditions, it seems logical to continue to apply the 2004 population number post-2004. Available information indicates that grizzly bears are increasingly showing up in places outside the NCDE recovery zone boundaries with bears in 2008 southeast of Shelby, in Simms 26 miles west of Great Falls, at Wolf Creek, and at Drummond. This anecdotal distribution information indicates the NCDE grizzly population is expanding in range which would be consistent with an increasing population. However, until the NCDE trend monitoring effort yields a trajectory estimate with acceptable confidence limits, we cannot say for sure that this population is increasing or decreasing from the 2004 number of 765. Given this, accepting the 2004 number as a reasonable estimate of population size in 2008 seems logical.

Following the methods in the 1993 Recovery Plan, we can apply the 4% mortality limit and the 30% female mortality limit to the population estimate of 765 grizzly bears in the NCDE as follows: To calculate the sustainable mortality limit: 765 x 0.04 = 30.6; To calculate the female mortality limit: 30.6 x 0.3 = 9.18; To establish the average known human-caused mortality over the past 6 years: (see Table 16.1)

Table 16-1. Known Human-Caused Mortality, NCDE, 2003-2008

Year	*All Bears*	*All Females*
2003	*16*	*7*
2004	*34*	*22*
2005	*25*	*10*
2006	*14*	*4*
2007	*26*	*7*
2008	*11*	*7*
Total	*126*	*57*
6-year average	*21.0/year*	*9.5/year*

Results
As of 2008, the 6 year average of known human-caused total mortalities in the NCDE is 21.0/year and this is below the sustainable mortality level of no more than 30.6/year. As of 2008, the 6 year average of known human-caused female mortalities in the NCDE is 9.5/year and this is above the sustainable mortality level of no more than 9.18/year.

Summary
This analysis is an interim application of the DNA-based population estimate of 765 grizzly bears using the methods in the 1993 Grizzly Bear Recovery Plan to determine the sustainable mortality limits for the NCDE. The methods used to establish the population size and trend of the NCDE population and the calculation of the sustainable mortality limits for this population will be reassessed in the revision of the Grizzly Bear Recovery Plan once the 5-year status review is complete in 2009. This memo is intended to serve in the interim time period between the NCDE population size estimate, the NCDE population trend estimate, and the revision of the Recovery Plan. This memo will be superseded by the revised NCDE Recovery Plan chapter upon its completion.

Based on the 2004 DNA work by United States Geological Survey (USGS) there was a minimum number of 563 individual bears identified roaming 8.2 million-acres. This is 2 ½ million acres beyond the 5.7 million acre recovery zone. With a high degree of confidence, the NCDE grizzly bear population estimate in 2004 was 765 animals, with a range reliably estimated to be between 715 and 831 individuals. Both the raw count of 563 grizzly bears and a total population estimate of 765 for 2004 illustrate the conservative nature of the 1993 recovery plan minimum population estimate of 304 grizzly bears in 2004. The DNA-based estimate is scientifically robust, and is more than two times the recovery plan estimate.

The results that were used in 2008 *Interim Revised Calculation of Mortality Limits in the NCDE* memo to the NCDE managers are conservative as the 2004 population size was used for all years beyond 2004 with an unknown growth rate at that time. To compliment the 2004 USGS DNA population study a NCDE-wide population trend study was started in 2004 and is ongoing. The trend study was in its 7th year during 2010 and the annual NCDE Grizzly Bear Population Monitoring Report (FWP April 2011) estimated that the population grows at a mean annual rate of approximately 3% (λ = 1.0306, 95% CI = 0.928–1.102). With a 3% growth rate since 2004 the 2010 NCDE grizzly bear population would be estimated at over 900 bears.

Since 2004 the FWP has monitored the survival and reproductive output of 104 female grizzly bears. Annual survival rates were estimated for females and males. Mean subadult and adult female survival was 0.884 and 0.923 for bears used in trend analyses. Survival rates for male bears captured for trend research averaged 0.815 and 0.862 for subadults and adults. Survival rates for management bears were lower. The ratio of reported to unreported deaths for both sexes suggest that for every 1 reported death, there were 1.46 deaths were not reported to management authorities. Home range size (95% isopleths) was largest for subadult females ($\bar{x}$ = 242 km²) followed by solitary adults ($\bar{x}$ = 164 km²). Home range sizes of females were nearly twice the size outside of Glacier National Park than inside. To date the FWP has analyzed 54 hair samples from the NCDE for stable isotope signatures. In general the FWP observed a higher incidence of meat in samples from the east side of the Continental Divide compared to samples from the west side.

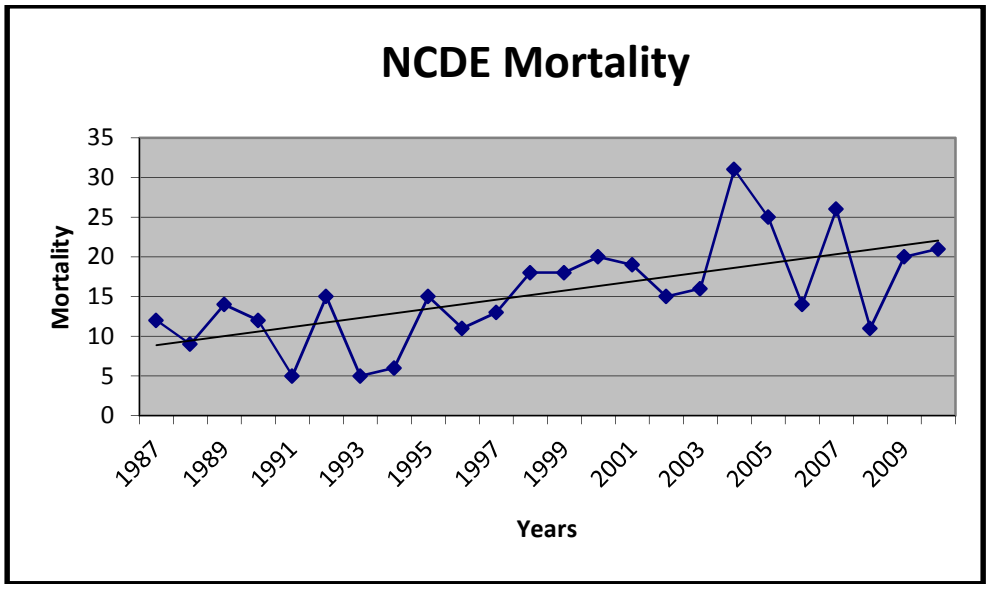
FWP evaluated the extent that radioed-instrumented female grizzly bears utilized the NCDE bear management units (BMU). BMU occupancy by females may be used as an index to bear distribution within the NCDE. Telemetry locations of bears were superimposed on both a 10km² in relation to BMU boundaries. Using telemetry data from 2004 through 2010 (with the exception some missing 2010 data from the east side of the Continental Divide), all 23 BMU's were occupied by female grizzly bears. Further, all BMU's were occupied by adult females, 21 of 23 were occupied by subadult females, and females with dependent young also occupied 21 BMU's. Further expansion of grizzly bear occupancy beyond the federal recovery zone is known based by telemetry, hair snaring, sightings and reported mortalities. This expanding range is also consistent with an increasing population.

NCDE grizzly bear mortality is reported annually and summarized by the Grizzly Bear Coordinator Chris Servheen. Known bear mortalities are shown in Table 16.2 and Figure 16-1.

Table 16-2. Sources of known NCDE Grizzly Bear Mortality

Category	1980-2002	2003	2004	2005	2006	2007	2008	2009	2010
Capture mortality	10	0	3	4	2	0	1	0	0
Car	13	0	3	1	0	7	1	0	5
Found dead	1	0	0	0	0	0	0	0	0
Human fatality	11	0	0	0	0	0	0	0	0
Human site conflicts or management	55	7	13	6	3	2	2	4	10
Legal hunter	81	0	0	0	0	0	0	0	0
Illegal	4	4	5	9	3	1	2	4	2
Livestock depredation	22	0	0	0	0	0	0	0	0
Malicious (also illegal)	44	0	0	0	0	0	0	0	0
Mistaken ID	29	0	1	1	1	1	2	3	0
Natural	15	0	0	0	0	0	0	0	0
Self-defense	23	1	1	2	0	4	1	6	0
Train	29	4	4	0	3	5	0	2	0
Under investigation	8	0	0	0	0	0	0	0	0
Unknown/Probable Illegal	10	0	4	0	1	5	0	1	3
Augmentation	0	0	0	1	1	0	2	0	1
Total	**355**	**16**	**34**	**24**	**14**	**24**	**11**	**20**	**21**

Figure 16-1. Annual known NCDE Grizzly Bear Mortality



In summation of the above sources of NCDE mortality, the Fish and Wildlife Service (FWS) wrote in their Biological Opinion On the Effects of the Flathead National Forest Plan Amendment 19 Revised Implementation Schedule On Grizzly Bears, October 25, 2005, *An increase in known human-caused mortality is associated with rural roaded areas and primarily private property. As described in this biological opinion, known human-caused mortality of grizzly bears on Forest Service lands is consistently lower than rural roaded private lands, despite bears spending significantly more time on forest lands than private lands.* The 5.7 million acre NCDE is 83% Federal and State, 10% private and 7% tribal lands. Analysis of the mortality data since 2000 continues to show similar mortality results in Tables 16-3 and 16-4 and Mortality Map.

Table 16-3. 2000 – 2010 NCDE recovery zone mortality plus a 10-mile buffer for counting mortality

Type of Mortality	Land Ownership*		Total Numbers	
	Fed/State	Corp/PVT		
Illegal	21	20	41	17%
Mistaken ID	9	6	15	6%
Self Defense / Defense of Life/Property	15	11	26	11%
Management Removal	18	41	59	25%
Capture-related (mgmt or research)	10	1	11	5%
Augmentation	4	1	5	2%
Auto	0	26	26	11%
Trains	0	22	22	9%
Natural Causes	6	7	13	6%
Unknown	14	4	18	8%
TOTALS:	97 (41%)	139 (59%)	236	
<500m of road			204	86%
>500m from road			32	14%

* All train and auto mortalities are listed as occurring on corporate/private lands

Table 16-4. 2000 – 2010 Mortality for the Flathead National Forest administrative boundary

Type of Mortality	Land Ownership*		Total Numbers	
	Fed/State	Corp/PVT		
Illegal	15	6	21	23%
Mistaken ID	6	2	8	9%
Self Defense / Defense of Life/Property	4	1	5	5%
Management Removal	4	11	15	16%
Capture-related (mgmt or research)	6	0	6	7%
Augmentation	3	1	4	4%
Auto	0	9	9	10%
Trains	0	10	10	11%
Natural Causes	0	0	0	0%
Unknown	10	3	13	14%
TOTALS:	48 (53%)	43 (47%)	91	
<500m of road			77	85%
>500m from road			14	15%

* All train and auto mortalities are listed as occurring on corporate/private lands

Human-caused mortality has increased over the years. Bear biologists expect this with an increasing and expanding population. Some individuals that occupy habitat with a lot of potential for conflict situations, such as unsecured foods and garbage and developed or private lands, have a higher mortality risk. This has created some concerns in the environmental community. Now with the known 2004 population estimate and known trend estimate bear researchers have demonstrated both an expanding and increasing NCDE population.

Grizzly bears are killed in various situations involving people, and a number of actions have been implemented that help reduce human-caused mortality. FWP has full time employees working with private individuals to help reduce mortality risk situations on private land. Many of the garbage dumpsters in grizzly habitat have been modified or converted to "bear resistant" dumpsters. An "aversive conditioning" program has been implemented to condition bears to avoid areas that humans use. A bear attractant storage program has been implemented on four national forests, Glacier National Park and the Blackfeet Reservation. Burlington-Northern Santa Fe-Pacific has implemented special management requirements in the Middle Fork of the Flathead River to address train operations, train crew awareness, and the cleanup of grain spills. A significant access management program has been, and continues, to be implemented on national forests (see Item 16b for more information on habitat). All of these actions result in reduced mortality risk to grizzly bears. The FNF employs the use of "bear rangers" to monitor bear attractant storage orders, to assist FWP bear biologists and campground hosts, and to maintain bear awareness information and education signs and posters in forest locations.

Recommended Action: The state FWP and federal FWS have the responsibility to monitor the population and trends. Estimates of population trends or female survival rates are not currently required for grizzly bear recovery in the NCDE. However, these parameters will greatly enhance the knowledge of population status and should be included for monitoring when the 1993 recovery plan is revised or if the bear is delisted. The Forest Service needs to 1) continue to cooperate with other federal, state and tribal agencies in the NCDE subcommittee conservation strategy and trend monitoring study, 2) continue to demonstrate actions that are known to reduce adverse effects to bears and, 3) continue to minimize bear/human conflicts.